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DEVELOPMENTAL ALEXIA: CONGENITAL WORD-BLINDNESS, OR INABILITY TO LEARN TO READ

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Congenital word-blindness, inability to learn to read, or dyslexia has been defined as an extreme difficulty to learn to recognize printed or written language on the part of persons otherwise normally endowed mentally and without defect of vision or other physical defect of such gravity as to constitute an interference of the process of learning to read. "Congenital word-blindness" is the term used by nearly all writers on this condition and for that reason will be used throughout this report.

This condition was first recognized in 1896. It was first referred to by Kerr[1] in the Howard Prize Essay of the Royal Statistical Society. Kerr discussed the needs of school children and mentioned that there were children in the schools who had no physical defects and were well endowed as to general mental ability who could not learn to read and were not understood by their instructors. He recommended that they be taught in separate classes.

Morgan,[2] an ophthalmologist, in 1896 reported the case of a boy of fourteen who was brought to him for examination of vision. The boy's parents thought that his inability to learn to read might be due to defect of vision. The vision was found to be perfect, the mentality of the boy to be good, but he confessed that "printed words had no meaning to him." Morgan applied the term "congenital word-blindness" to such cases.

Nearly every year since then one or more persons, mainly ophthalmologists, school physicians, and other medical men, have

[1] Kerr, Howard Prize Essay, Brit. Royal Statistical Society, 1896.

[2] Morgan, "Congenital Wordblindness," *British Med. Jour.*, 1896.

reported such cases coming to their notice. Several writers have each appeared from time to time with such reports. With but a few exceptions the data advanced in proof of the good general mental ability of the subjects have been convincing. In such cases the subjects were found to be capable of learning the arithmetic and other school subjects not depending upon reading ability, capable of conducting themselves satisfactorily in social ways, and with good memory for poems, songs, etc. One writer tells of a brilliant surgeon who could read almost nothing but acquired all knowledge by ear. Another tells of a congenitally word-blind person who became a successful lawyer, though able to read very little. Most of the cases reported improved with special teaching and with time, some of them to the extent of becoming almost normal in reading ability.

Many writers have discovered a hereditary factor. Thus Stephenson[1] (1907) found six cases affecting three generations of one family. Thomas[2] (1905) and Warburg[3] (1911) found the hereditary factor markedly present in the many cases observed by them.

The theories advanced as to the etiology of this condition have been derived from the knowledge gained in observation of cases of alexia, or loss of ability to read through disease. In such cases lesions of the left angular gyrus have been found to exist, and this area of the brain has been fixed upon as the center for recording images or memories of printed or written words. Therefore congenital word-blindness is attributed to lack of development of this portion of the brain. Rieger[4] (1909) dissents from this view, maintaining that word-blindness is not related to any particular center of the brain but is only one factor or aspect of low intelligence, that a word-blind person is "idiotic" in that one respect. He proposes to substitute for the term "congenital word-blindness"

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[1] Stephenson, "Six Cases of Congenital Wordblindness Affecting Three Generations of One Family," *Ophthalmoscope*, 1907.

[2] Thomas, "Congenital Wordblindness," *Ophthalmoscope*, 1905.

[3] Warburg, "Über Ageborene Wortblindheit und die Bedeutung für den Unterricht," *Zeit. f. Kinderforschung*, 1911.

[4] Rieger, "Die Kongenitale Wortblindheit nach den Berichten von Augenarzten," *Arbeiten aus den Psychiatrischen Klinik zu Wurzburg*, 1909.

partial idiocy in connection with reading of words alone or also of figures. Rutherford[1] (1910) found a case of word-blindness in a family showing symptoms of degeneration for three generations. Anent this he said, "The condition is thus seen to be of the nature of a reversion to the precivilized type as the result of the loss or destruction of certain of the later and more highly specialized determinants in the gametic idioplasm, and as such it falls in line with many of the phenomena of atavism." Warburg found that the condition existed only among the poor class and that many of the mothers of such children had borne many children, were wage-earners at the same time, and were undernourished. He thought that the defect was a result of this antenatal condition of poor nutrition. McCready[2] (1910), commenting upon the fact that girls constitute a small percentage of the cases, attributes the larger percentage of boys to the fact that the heads of boys are larger at birth than the heads of girls and more liable to injury. He also makes the suggestion that more boys may be reported because the education of boys is more important than that of girls and any interference is more likely to be reported, or that girls attend to their studies better. Jackson[3] (1906) proposes to substitute the term "developmental alexia." He says: "Spoken language is generally pretty well acquired before the effort to understand and employ its written symbols is commenced. Any lack of co-ordination between visual centers and those already developed to serve the faculties of hearing and speech would cause alexia. . . . . The co-ordinations required for the comprehension and use of language are extremely complex and the failure of these to connect with the visual impressions at any point would be a sufficient explanation of these cases."

The extent of congenital word-blindness was reported upon by Thomas[4] (1905), who as assistant medical officer of the London County Council was able to come into contact with all cases of backward children who were required to be reported to the medical inspectors. He calculated that cases of congenital word-blindness existed to the extent of one in two thousand of the elementary-school population. He found that 25 per cent were girls. Warburg,[1] school physician of Köln, found fourteen among two thousand Volksschule children and seven others among four hundred Hilfsschule children.

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[1] Rutherford, "The Etiology of Congenital Wordblindness," *Brit. Jour. of Children's Diseases*, 1909.

[2] McCready, "Wordblindness as a Cause of Backwardness in School Children," *Penn. Med. Jour.*, 1910.

[3] Jackson, "Developmental Alexia," *A. J. of Med. Sc.*, 1906.

[4] Thomas, *op. cit.*

Many of the cases reported in detail improved in ability to read with individual instruction. The reports of these cases go to show for the most part that they learned to read by first gaining an understanding of the phonetic principles underlying printed language. Fisher[2] (1905) advocated the "look and read" method, that is, learning printed words by sight merely and not through phonetic analysis, because it was "obviously desirable that the shortest route to reading should be taken." The case which he reported, however, learned by the method of phonetic analysis. The phonetic method has been advocated by all other writers who made suggestions for the education of such cases.

McCready[3] reported the methods used in teaching a twenty-year-old boy, who had not at that age learned to read, which are of value even though one may doubt the diagnosis of congenital word-blindness. At the time of becoming a patient of McCready the boy was a stutterer; he had been wearing glasses for eleven years; he was suffering from a high degree of hypermetropia with a moderate amount of primary atrophy of both eyes. The boy confessed that he stuttered often when reading to cover the fact of inability to recognize the words. These facts are sufficient to give greater credence to another type of explanation for the poor reading ability than the diagnosis of congenital word-blindness. In the treatment of this case McCready says:

> The object aimed at . . . . after the correction of the speech defect was the development of the visual word center in the right hemisphere, and the establishment of functional relationship between it and the auditory word center as well as Broca's center in the left hemisphere. To this end the patient

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[1] Warburg, *op. cit.*

[2] Fisher, "A Case of Congenital Wordblindness," *Ophthalmic Review*, 1905.

[3] McCready, "Congenital Wordblindness as a Cause of Backwardness in School Children," *Penn. Med. Jour.*, 1910.

> was first taught to use his left hand, as advised by Bastian in the acquired form of word-blindness and later by Claiborne in the congenital form. He was then made to receive oft-repeated impressions of words through every possible avenue, through his auditory center by hearing himself pronounce them, which last brought the glosso-kinaesthetic center into play by tracing over words, at the same time pronouncing them himself, thus bringing all the centers involved in speech in accord at the same time. In addition he was given visual impressions of words in as many forms as possible, written, printed, on the blackboard, cut out of cardboard, on the spelling board, etc. . . . . He can now read a page of printed matter composed of the more common words almost as quickly as a person with normal visual memory, and is able to read for pleasure. . . . . His progress in other elementary studies is equally satisfactory.

Thomas[1] recorded some observations of congenital word-blind children which are of interest:

> One child by rapidly spelling the letters with the lips will arrive at the meaning of the word, another will trace the letters in the air or on the book with the fingers, and thus arrive at the meaning. A child . . . . was unable to assign the meaning to a word until he had written it himself; if he looked at the word "cat" it conveyed no meaning; if he had it spelled aloud to him he could not arrive at the word (he was a poor "audial" as well as a poor "visual"), if he spelt aloud the word himself he could not tell what it was; but immediately after he wrote it down his puzzled expression gave place to one of intelligence and he shouted the word "cat."

The foregoing paragraphs constitute a general account of the literature on congenital word-blindness from the standpoint of the medical profession which has been almost alone in recognizing and isolating this type of mental defect. Schröck[2] (1915) discusses in detail all previous reports with a bibliography of thirty-two names. The reader is referred to that article for further detail. A shorter account by Clemesha[3] (1915) may serve the same purpose.

On the psychological side but few references are found. Voss[4] (1914) gave a set of stimulus words to two groups of children, eight to ten, and eleven to thirteen years of age, respectively. One thirteen-year-old child was a case of congenital word-blindness. He found that this boy's reactions were on a lower plane of intelligence than those of the average or well-endowed children. He suggests that the association method may be of value in revealing the mental content of aphasia and speech-defect cases.

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[1] Thomas, *op. cit.*

[2] Schröck, "Ueber Kongenitale Wortblindheit," *Klin. Monatsbl. f. Auhenh.*, 1915.

[3] Clemesha, "Congenital Wordblindness," *Jour. Ophth. and Otolaryngol.*, 1915.

[4] Voss, "Über die Assoziationsprüfung bei Kindern nebst einem Beitrag zum Frage der Wortblindheit," *Zeitschr. f. d. ges. Neurol. u. Psychiat.*, 1914.

Witmer[1] (1907) reported a case which he diagnosed as *amnesia visualis verbalis*. The case was not one of true word-blindness, however. The child was found later to have a visual defect and improved in reading in a reasonable time after correction of this defect. In 1914 Witmer called attention to a class of children with mental defects as distinguished from mentally defective children. In this article a child was reported as a case of congenital word-blindness, but who at times suffered a degree of word-deafness and motor verbal aphasia. The description of the child shows him as too complex a case to be diagnosed as simple congenital word-blindness. What Witmer says upon the subject of special defects is worth quoting:

> While it is doubtless true that brain injuries may produce aphasia and amusia in children and if such injuries occur during uterine life the condition may properly be described as congenital, nevertheless I believe we must consider that congenital aphasia and amusia do not rest upon a pathological condition of the brain, but are indicative of a tendency to biological variation appearing in the affected children restrictedly as variation of the functional activities of language and music. Congenital aphasia and amusia are to be explained in biological terms, in somewhat the same manner as we should undertake to explain left-handedness in about 2 per cent of the race.

Town[2] (1912) in an article on "Congenital Aphasia," mentions the fact of inability to learn to read and includes it among the aphasias.

In the experience of the writer as examiner of problem children of the public school, those who find difficulty in learning to read quite out of proportion to their ability to learn other subjects and not at all or not adequately accounted for by general poor mental ability are frequently met with. Of this number thirteen have been diagnosed as cases of congenital word-blindness in the sense in which the term has already been defined by the medical men quoted above. These were found in a school population of 42,900 in fifty schools. The necessary conditions of such diagnosis are: (1) Regular school attendance. (2) Reasonable good health and physical condition in general. No child showing evidence of poor nutrition, rachitis, much enlarged tonsils and adenoids, tuberculosis, kidney trouble, or other severe types of physical disability should be so diagnosed. (3) No sign of visual defect. (4) Persisting extreme slowness in learning to read; or total inability, manifested over one or more years of school life. (5) General mental ability good or average. (6) No other interfering factor, such as foreign language in the home, dislike of school, abnormal unresponsiveness to school or other social situations, etc. There are many cases of slowness in learning to read which are complicated by one or more of the contributing factors above. Learning to read is an exceedingly complex process requiring continuity and concentration of attention. Therefore any weakening of the physical condition interferes with the process and causes backwardness in the attainment of facility in reading to a much greater extent than other subjects are affected—granted that there is not innate mental defect.

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[1] Witmer, "A Case of Chronic Bad Spelling, Amnesia Visualis Verbalis," *Psych. Cl.*, 1907; "Children with Mental Defects Distinguished from Mentally Defective Children," *Psych. Cl.*, 1913.

[2] Town, "Congenital Aphasia," *Psych. Cl.*, 1912.

The examination of the children here reported consists of a physical and mental examination and a report of health and developmental history wherever possible to obtain. In a few cases the latter were not obtainable because the mothers were working women or for some other reason were not seen.

The physical examination is such as can be made without the removal of clothing. It includes examination of teeth, of the nose and throat for breathing obstructions, hearing and vision tests, observation of nutritional condition, and other evidences of health condition. The vision test is made with the child standing just before an outside window and the test card placed opposite the window at a distance of twenty feet. The illiterate E chart is used. Indications of possible eyestrain, such as frowning, etc., reports of headaches, and blurring or indistinctness, etc., are sought for. No oculist's examination was obtained in any of the cases here reported.[1] That the difficulty is not of sensory origin is evidenced by the following facts: (1) In nearly every case there was visual recognition of a greater or less number of words. The words which were recognized were not necessarily simple or short words. (2) The child's difficulty in every case consisted in the inability to learn phonics—to associate the sounds of letters with the letters themselves. (3) The children who were given special attention were taught phonics and with the mastery of that tool made progress in learning to read. One child became a normal reader, and the younger children under special teaching are at the time of the writing of this paper promising to become so. (4) They could all match words, that is, when shown an unfamiliar word could pick it out from among other unfamiliar words. All could point out the difference in two words differing by one letter. Those who were old enough to have learned to write could transpose a page of print into script without being able to read the script. These bits of evidence go to show that the difficulty was central and not sensory.

In the mental examination those tests are most relied upon which show the child's ability to think or reason. It is the practice of the writer to use such tests for innate intelligence as depend least upon experience or teaching which cannot or may not easily be evaluated by the examiner. In the examinations for mental ability of the general public-school clinic one cannot depend slavishly upon scales of measurement of mental age, however excellently these may have been constructed with reference to the average child and his experiences. The problem child is more or less outside the experiences usual to the child who is in all respects normal and must be examined and diagnosed always with reference to this possibility. It is not the writer's practice to determine a "mental age" in every case. The time to do this is added to the ordinary examination only occasionally. Some of the tests which enter into the various scales for determining mental ability are always used, for the most part those testing reasoning ability. The writer's attitude toward tests of mental ability was discussed to some extent in the monograph, "Standardization of Tests for Defective Children." The writer can only apologize to the readers of this article who are accustomed to think of mental ability in terms of the mental age of some one of the scales for its measurement, but they can be assured that enough of the Binet and Terman scales were given in all but two cases to assure an approximate normal mental age, though a definite statement of a mental age in months cannot be made from the tests given. The thought of publication of results came only after the usual procedure for determining mental ability and a diagnosis of the cause of the child's trouble had been made for some time. Then, too, the data are the result of a gradual accumulation and were not obtained as one whole and connected problem but garnered out of the mass of all cases seen.

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[1] The writer is informed by oculists that eye trouble of sufficient gravity to constitute an interference can be ruled out in cases showing up normally in these respects.

The mental examination is made along the following lines: First, by way of becoming acquainted with the child's general traits of responsiveness, social orientation, use of language, and to give him time to get on a friendly footing with the examiner he is asked about age, birthday, place of abode, father's occupation, number of brothers and sisters, their ages, grades in school, what they are doing now, etc. Children who know such family data are always glad to tell it. Any spontaneousness or volunteer information is encouraged with a show of interest that the child may feel free in expressing himself. Secondly, he is given school tests of reading, arithmetic, etc. A child's comprehension of arithmetic and his ability to deal with arithmetical problems is an important bit of evidence in making a diagnosis of mental ability. Many high-grade defective children learn arithmetical processes without the ability to use the same in thinking ways or to comprehend the mathematical meaning of what they have learned. A child may have learned the process of long division, for instance, without being able to find the solution of such a problem as, *If 5 pencils cost 10 cents, how much will you have to pay for one pencil?* He may by some accident of school life not have learned the processes of work with fractions taught in the fifth grade, but he may possess an understanding of the arithmetical meaning of fractions and do problems in reasoning with fractional parts not involving the knowledge of book processes. The child who has learned arithmetic in normal fashion has shown his ability to think of abstract concepts in symbolic terms. The ability to use symbols to represent abstract conceptions is the most significant distinguishing characteristic of the normal human mind of our civilization.

In the reading tests one learns just how much the child can read, how well he can handle phonics as an aid in reading new or unfamiliar material, whether he gets information from reading, and whether he can organize the material read by giving a full account or an adequate account of it with the omission of only unnecessary details. With the children who cannot read their ability to make the perceptual discriminations necessary is tested by asking them to match words. For this test page 103 of the *Howe First Reader* is used. On this page many words are repeated several times throughout the selection. The examiner points to any one of the words the child does not know and asks him to find another just like it on the page. He is given all the time necessary to find it. A circle is drawn about the sample word to help him in finding it again for comparison with the words he thinks may fit the requirements. He is given several such until the examiner is certain he does or does not possess such powers of discrimination. On the same page in juxtaposition are the words "our" and "out." The child is asked to look carefully and say whether the words are exactly alike, and when he reports that they are not to point out with the pencil the parts that are different.

Other tests used for the purpose of giving expression to thinking ability are: the counting backward test, the difference test of the Binet Scale, the likeness tests of the Terman Scale, the puzzle tests one, three, and four of the Healy-Fernald Series, the cross-lines A and B of the same series, a time orientation test, opposites test, the Healy pictorial completion test, etc. This is almost a minimum list for young children which is extended downward or upward with reference to the particular problem of the particular child under examination. To some children a test of color analysis is given. This test is possible because the color gray is not commonly taught in the first grade and many children do not know it. They sometimes hazard the names black or white, but readily agree that it is not like the black or white shown them. They are then asked to make a name for it and often they decide to call it a faded or light black or a dark or dirty white. In the time orientation test, children of first- and second-grade age are not penalized if they do not know the names of the days of the week. They are graded satisfactory if they know that the current day is not Sunday, and say in answer to stimulating questions that it is a week day or a school day and can tell what they do on Saturday and Sunday. The time test can be made more and more complex for older children until it involves historical data. The memory tests commonly used are digits heard and the two Binet designs.

For other evidence teachers are questioned concerning the child's school reactions, his ability with the handwork of the school, apathy or diligence in work, etc.

In the following accounts of cases the attempt is made to describe the child's intelligence in terms of a few of his highest reactions and whatever his disabilities may be in terms of his lowest reactions, rather than to take the necessary space to describe the mental examination in detail. The children here reported showed up normal with respect to the various lines of inquiry mentioned above unless otherwise stated.

In general two reading selections are used as tests of reading ability. Selection A is on page 100 of the *Howe First Reader*, which is in use in the schools of Chicago. The selection is, therefore, familiar to all children who have passed through the first grade within the last five or more years.

SELECTION A

The Fox and the Grapes

One day a fox went down the road. "How hungry I am!" he said. "I wish I could find something to eat." Just then he saw a grapevine. It had ripe grapes on it. "Oh, how good those grapes look! I will have some," said the fox. But he could not reach the grapes. They were too high on the vine. He jumped high up in the air, but he could not get them. At last he went away hungry. The birds heard him say, "Those old grapes are sour. They are not good for a fine fox like me." But the birds knew better.

SELECTION B

It was a fine spring morning in the year 1826, about ten o'clock, when Mr. Amos Bliss, the manager and one of the proprietors of the *Northern Spectator*, might have been seen in the garden behind his house planting potatoes. He heard the gate open behind him, and without turning or looking round became dimly conscious of the presence of a boy. But the boys of country villages go into whosesoever garden their wandering fancy impels them, and, supposing this boy to be one of his own neighbors, Mr. Bliss continued his work and quickly forgot that he was not alone.

Case 1: Girl.—First seen in March, 1913; age ten years and one month; in the fourth grade, grade normal to her age. Physically only fairly well nourished and developed, enlarged tonsils, slight finger twitch. The mother did not come to the clinic when sent for, but sent word that the child had never been ill. No other members of the family were in school at this time, but two years later a brother of six years was making normal progress. Educationally she was doing well in all the work of the school except that she could not read. She was a favorite with teachers and pupils, who gave her special help in acquiring school instruction. She could do the arithmetic work of her grade very well and the handwork of the grade and was considered a very intelligent child. She was making rapid progress in music. In reading she could recognize some words, but was never certain of even the simplest ones. She herself never knew but that she might only be guessing at the word. She had no knowledge of phonics and, therefore, could not spell. At this time she was taken by the speech teacher for special instruction in reading. The teacher began with the elementary phonics work and gave her several periods a week of help.

When seen the second time in October, 1914, she then read Selection A in 38 seconds with no errors. She read Selection B in 2 minutes and 25 seconds with five errors, which, however, were worked out with approximate phonetic accuracy. She was able to read the selection by spelling out most of the words. She was at this time still making rapid progress in music, taking work in one of the best musical colleges in the city. She was in the sixth grade and reported by her teacher as doing very good work, but was still having some help from her schoolmates.

She was again seen in May, 1916, in the seventh grade. Her teacher reported that she made good grades, and, being a teacher new to the school, was surprised that this child had ever been referred for psychological examination. At this time she read Selection B in 1 minute and 10 seconds with three errors worked out approximately correctly. She read a newspaper paragraph of twelve lines in 1 minute, making such errors as "stringent" pronounced "striget," "driving" pronounced "drivving," "verdict" pronounced "vedict." She was able at this time to give a very interesting introspection. She said that after being out of school for a week and not reading she would forget how to read, and then when going back to it would have to begin all over again to work out all the words phonetically. She said, "I look at the letters and then keep wondering and wondering what is the sound, and finally it comes back to me."

Case 2: Boy.—Was first seen in June, 1913; age thirteen years and five months; in the fourth grade. Physically he did not show up very well; there was a flabbiness of musculature; dark circles under the eyes; eyeballs yellow; Hutchinson teeth; some enlargement of the tonsils; slight occlusion of the breathing spaces. The mother, a working woman, could not come to the clinic, but the boy told of his poor health; said his doctor told him he had ulcerated stomach and at that time was on a diet of milk and rice. He had two older brothers. One was not at home and the boy did not know his school record. The other, fifteen years of age, was in the first year of the high school. The boy's teacher reported that he was very bright with the arithmetic of the grade. He was permitted to do the handwork of higher grades. He was at this time considered a mechanical genius. A year before he had made a magic lantern which was workable out of odds and ends assembled by himself. In reading he could recognize very few words; he had no knowledge of phonics and made absurd guesses in lieu of word recognition. He was very much worried about his inability to read and said that he had been receiving special help from his father at home at night. He was placed in the special room at this time, but retained there for only a short time, since naturally the association with subnormal children was very distasteful to him and the special teacher was giving him no help. He was then sent to the fifth grade, through which he passed with a good record with the special help of his teacher, who read his arithmetic lessons and other lessons to him, and he was thus able to work through the grade and was promoted to the sixth grade. It may be remarked here that the arithmetic work of the fifth grade, involving fractions, is the most complex of all of the arithmetic in school. A child who has passed fifth-grade arithmetic creditably has proved his ability to make further progress in the arithmetic of the higher grades. He was then admitted to the technical high school, where he stayed two years. He there made a splendid record. After leaving the technical high school he was employed in an electric motor-shop and was there considered a fine electrical machinist. He left this place after a few months because of some labor-union troubles and was taken into the steel mills, first as an errand boy, but he was soon put upon machinist's work. He is now working there and considered a very satisfactory mechanician. His most recent teacher reported of him that he had learned to read material in connection with his work. The writer met the boy at one time outside the clinic during his technical school period and asked him about his reading ability. He said sadly, "Oh, I still have lots of trouble. There are some other boys in the school who have the same trouble." At this second interview he reported very good health and appeared to be in excellent physical condition.

Case 3: Boy.—Age eight years and five months when first seen by the writer in January, 1916. He had been examined upon various occasions previous to that by other members of the department of child-study who considered him not a mentally defective child. He had been in the first grade for a period of ninety weeks and was sent in by his teacher because of his inability to learn to read. The mother was not seen but sent in a health history by the nurse who brought the child, to the effect that he had never had any serious illness. He had had measles once and a slight attack of bronchitis at one time. Physically the boy was in good condition except for several carious teeth and a slight occlusion of one nasal passage. There were three sisters of working age whose school records were not obtained. He tested eight years by the Terman Scale except that he failed to count backward from 20, but counted backward from 10. Since he had spent all of his school life in the first grade he probably had little acquaintance with numbers beyond 10, as the school program for the first grade does not go farther than 10 in the number work. He worked out number combinations, such as 7 plus 8 and 10 minus 6, with the use of marks. He did No. 4 of the Healy-Fernald Series, Construction Puzzle B, with only two errors, in 40 seconds. He succeeded with cross-line A of the Healy-Fernald Series at the first attempt; with cross-line B at the second attempt. His replies to a set of ten easy opposites were prompt and correct for seven of the number; he did not know the opposites for the words "truth" and "sick," and thought of the opposite for "sad" after the stimulating question, "If you are not sad, then how do you feel?" He named the seven colors, red, green, blue, yellow, purple, orange, and gray, but called the orange dark yellow. Conversationally he was bright and alert, though somewhat shy. The nurse who had visited the home said that the boy was devoted to mechanical toys of the constructive type, and the boy himself with glowing interest told of his love for these toys. He read Selection A in 7 minutes and 45 seconds with sixteen errors. Of the sixteen errors, when told that he had made an error, he corrected six. He could not succeed in recognizing such words as "said," "could," "were," "at," and "last," though these words occur many times in the *First Reader* which he had studied. The recommendation was made to the school that he be promoted to the second grade, where his interest in handwork would find expression and where his ability to learn numbers would receive training. Since it was apparent that he had some slight knowledge of phonics, though he was very little self-helpful with the phonics, it was hoped that he might take a new interest in reading with the newer material of the second grade and make some progress. Seven months later, when the writer sought to see this child again, it was learned that he had died. His mother said the cause of death was dropsy. The second-grade teacher said he was bright in everything but reading, of which "he could not get any idea."

Cases 4 and 5: Boys, twins.—Age nine years and one month when first seen in June, 1914. The mother said she suffered from dropsy during gestation. The babies were artificially fed and did not thrive until after three months of age because the food did not agree with them. Walking began at two years of age; talking at one; they had always been very healthy with only light attacks of measles, whooping cough, and scarlet fever. At the time seen they were both in fine physical condition except for slight occlusion of the breathing spaces and defective teeth, luetic in character. No other members of the family were of school age. At the time they were seen these boys had been in school for two and one-half years and had learned almost nothing. They had had various teachers, each one of whom was very ambitious to teach the boys to read since they showed up so very bright in other respects. They accomplished all the tests up to and through the ninth year of the Binet-Simon Scale except for making change for 20 cents and failing with the year and the day. They could not count backward from 20 since neither could count forward to farther than 12, but both counted backward from that point. A few of the Binet tests beyond this point were given to test thinking ability. Their ability to control thinking processes was shown throughout rather remarkably. For instance, when asked to give the day, neither one of them knew the exact day of the month, but one of them said, "This is the second week," and the other said, "There has only been one week before this." The day of the month was the eighth. Boy A failed with the absurdities test; Boy B did not, including the very difficult absurdity discarded from the latest Binet Series—*I am taller than John, John is taller than Henry, and Henry is taller than I am.* Boy A gave a correct definition for "honor," but failed on other abstract words. Boy B gave correct definitions for "honor," "charity," and "pity." Boy A had a memory span for seven digits; Boy B for six. Boy A did Construction Puzzle B, No. 4, of the Healy-Fernald Series with only five errors—a very good record. Boy B did the same test with fifteen errors—not a wholly bad record; he did it a second time upside down with reference to its previous position without error. Boy A did cross-line A of the Healy-Fernald Series at the first attempt but failed with cross-line B. Boy B did cross-line A at the first attempt and cross-line B at the second attempt. In reading, Boy A could recognize visually a fairly large number of words but had almost no knowledge of phonics. Boy B could recognize very few words visually but could recognize a few simple words that were spelled to him, though he would make very absurd guesses at times. Boy A could find the answers to problems such as 7 plus 8 and 10 minus 6 and *If you had a dime and spend 2 cents for candy and 4 for an apple how much money will be left?* by the use of marks. Boy B had not yet discovered the method of finding the results of number combinations. Both these children were bright and alert, with a good use of language, talked about their own affairs connectedly and sensibly, and each one had the habit of saying, when given difficult tests, "Now just wait a minute, let me think," and the result at such times showed that they really had been able to think. They were both recommended for residence in the special room with special emphasis upon reading. They were seen again in January, 1915. They had made very little progress but still a measurable one in learning to read. They had made such a gain in phonics that they knew the phonetic value of individual letters but could not work out words. They had made some progress in number work, though this was not much stressed in their school work. Boy A was seen again in April, 1916. He then read Selection A in 65 seconds with but one error, corrected. He had such a knowledge of phonics at this time as enabled him to spell out and pronounce correctly simple one-syllable unfamiliar words. He wrote from dictation, "The cat ran away" spelling "ran," "run"; could not correct it. Boy B at this time had been sent to a parochial school in order to separate him from his brother because of their propensity for getting into mischief. At this time they were both working for a grocer, after school hours, who reported to their teacher that they were thoroughly reliable help and that they knew the stock better than he himself did.

Case 6: Boy.—Age eight years and eight months when first seen in April, 1914. He had then been for forty-eight weeks in the first grade and was showing up as exceedingly slow in learning to read. Physically he was in very good condition, well nourished, sturdy, strong, well developed, fine looking. At this time few tests were given him aside from school tests. His attempts to read Selection A were very absurd. He pronounced "hungry," "warm" and then guessed "thirsty." He could spell out a few of the words correctly. He was able to do much more number work at this time than is taught in the first grade. He could work with combinations under 10 easily and do larger combinations by the help of marks on paper. His conversational abilities showed much intelligence. He told about his home life with good use of language, connectedly, etc.

At the age of nine years and four months, when next seen in December, 1914, he had spent two years in the first grade and more than one and a half in the second grade. He succeeded with all tests of the Binet-Simon Scale through nine years of age. His good thinking ability was shown in various little ways. For instance, when asked the date he at first gave it up but later gave it correctly, and when asked how he knew he said, "I thought about the letter my mama got yesterday." He had a memory span for seven digits. In answer to the problem, *If you have a quarter and spend 5 cents for candy and 3 cents for an apple, how much money will be left?* he said, "I would have 15 cents and 2 cents—17 cents." He did cross-line A at the first attempt, cross-line B at the second attempt. Upon this occasion he read Selection A in 3 minutes with three errors, corrected. He had to spell out many of the words phonetically. He read the first sentence of Selection B, spelling out "Bliss," "manager," and "house" phonetically correct. Could not work out "proprietor," "northern," "spectator," "planting," "potatoes." His teacher thought that he had improved very little in reading, though the reading test showed that he had made some progress. His teacher was giving him special help in the evenings after school. When he was promoted to the third grade his new teacher reported of him that he was good in numbers but that reading and spelling were very poor. She considered him not a good first-grade child in these two subjects. She said that he could work out words phonetically with some encouragement, but that he was not much inclined to do so of his own initiative. He received special attention with reading at home. He was seen again in February, 1917, having just been promoted to the fifth grade.

His teacher reported that he was good in the arithmetic work of the grade but poor in reading. He read Selection A in 1 minute, but was unable to recognize the word "grapevine." He read Selection B in 6 minutes, having to spell out most of the words and failing with some of them. He failed with the words "Bliss," "proprietor," "spectator," "because," "conscious," "presence," "villages," "whosesoever," "wandering," "continued." He wrote correctly from dictation, "The cat ran away"; "The printer made some cards." He did a problem in long division and showed the necessary knowledge of fractions for the work of his grade. He passed all the tests for ten years of the Terman Scale except for the reading and report test, which was not given. Of the twelve-year tests he was given the definitions test, passed; the fables test, making a score of $1\frac{1}{2}$; and the similarities test, passed. He had a memory span for seven digits.

Case 7: Girl.—Age seven years and ten months when first seen in March, 1915. Physically she was tall and well developed for her age, with no defects of any sort. She is the daughter of a successful physician, who reported that her health history was of the very best. A sister of nine was in the third grade and making good progress. A sister of eleven was in the fifth grade and doing satisfactory work there, but was reported by the principal as having been very slow in the beginning of her school work. This sister was aware of her past difficulty in learning to read. She said, "I didn't know how to pay attention then." She told of her despair with her small sister. She said, "I try to teach her, but she doesn't pay attention; when I point to a word and tell her to look at it I find her looking at the ceiling or at her shoe," and this without any desire to be recalcitrant and a real desire to learn to read. It was merely that the child was unable to find a point to which to attach attention. Our patient had spent sixty-six weeks in the first grade. In reading Selection A it was easily apparent that she read from memory of the context, rendering the first sentence, "One day a fox was walking along the road." She was able to go through the selection in this way, getting in all the items but quite unable to correct any of her very absurd errors. She had no knowledge of phonics. She was getting special help from a private teacher.

She knew much more about number work than was taught in the first grade; she knew most combinations under 10 and could work out more difficult ones by counting on the fingers. She could count backward from 20. She did the Healy-Fernald Construction Puzzle B with only three errors, working with apparent thoughtfulness. She did cross-lines A and B at the first attempt. She gave answers to the difference test of Binet and Terman in good clear sentences. She had a memory span for six digits.

She was seen again in October, 1916. She did not show up much better in reading than at the first test, but showed a greater knowledge of simple phonics. She could work out phonetically simple one-syllable words containing two consonants and a vowel, such as "fan," "pat." She was in the second grade at this time and doing normally well with all the work but reading.

Case 8: Girl.—Age eight years and five months when first seen in November, 1915; member of the second grade. Physically a well-nourished and a well-cared for child. Reported by the mother always to have been healthy. The parents are college-educated people in literary occupations. An aunt of this child is a well-known writer and literary critic. There were no other children in the family. The child was considered by her teachers as very bright. She was good in the number work of her grade, in story-telling, dramatization, etc. She passed the eight-year set of the Terman Scale and some tests beyond, including tests seven and eight of the twelve-year set. She did the Healy-Fernald Construction Puzzle B with two errors. Did cross-line A and cross-line B at the first attempt. She read Selection A in 9 minutes and 17 seconds. She worked manfully at the selection and succeeded in working out some of the words phonetically correct, such as "wish," "good," "last," "went," but at the same time failed on such words as "hungry," "eat," etc.

She was next seen in February, 1917, age nine years and eight months. She was in the fourth grade and reported by her teacher to be exceedingly apt in all the work of the grade but reading, though having improved in this subject recently. When she was given unfamiliar material to read she was adept at filling in the context in a logical and well-organized manner, and could thus render the substance of the material read correctly, though able to recognize about one-third of the words. Whenever her ability to recognize a word failed she searched desperately ahead until she found words that she could recognize and then went on filling in the context quite logically. She read Selection B at this time in 6 minutes and 40 seconds, spelling out sixteen of the unfamiliar words phonetically correct. Such words as "spring," "morning," "manager," "planting," "turning," "supposing," etc., she worked out successfully. Failed with such words as "proprietors," "spectator," "conscious," "presence," etc.

[*To be concluded*]